Chapter 5: Exploring Mixtures and Their Separation

PLAY & LEARN

- 10 Challenges.
- No Peeking.
- Step up to the board.

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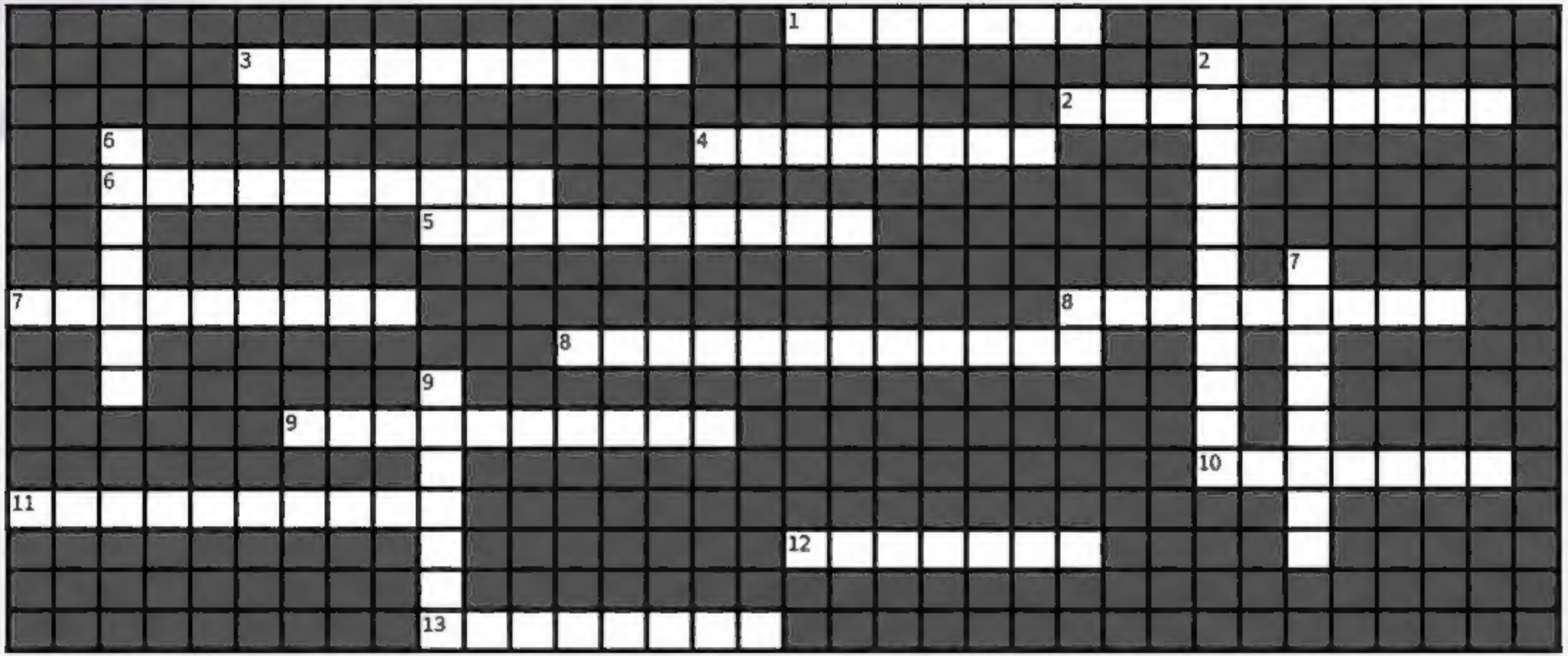
Puzzle 1 · The Crossword

Every answer is a word from this chapter. Fill the white squares — one letter per square.



ACROSS

3. separates an insoluble solid from a liquid (10)
4. a homogeneous mixture of solute and solvent (8)
5. spins a mixture at high speed to separate its components (10)
7. a heterogeneous mixture with visibly settling particles (10)
8. technique that separates dyes by how far they travel on paper (14)
9. solid turning directly into gas (11)
11. recovers a dissolved solid by driving off the solvent (11)
12. the substance that dissolves in a solution (6)
13. the substance that does the dissolving (7)

DOWN

1. a mixture between a solution and a suspension (7)
2. the maximum amount of solute that can dissolve (10)
6. separates liquids by boiling point (12)
8. clumping together of colloidal particles (11)
9. a solution holding the maximum solute it can at that temperature (9)
10. surname of the scientist behind the light-scattering effect in colloids (7)

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Puzzle 2 · Word Search

16 terms are hiding in the grid — across, down, diagonally, and backwards. Circle each one, then tick it off the list.

- [ ] DISTILLATION
- [ ] EVAPORATION
- [ ] SUSPENSION
- [ ] FILTRATION
- [ ] SOLVENT
- [ ] MIXTURE
- [ ] SOLUTE
- [ ] PANGA
- [ ] SUBLIMATION
- [ ] DECANTATION
- [ ] SOLUBILITY
- [ ] SOLUTION
- [ ] COLLOID
- [ ] TYNDALL
- [ ] FUNNEL
- [ ] SMOKE

Race Rules

- **Solo:** find all the words. Note your time.
- **Pairs:** one partner finds across-and-down words, the other finds diagonals.
- **Hard mode:** cover the word list. Find as many terms as you can in 5 minutes.
- **Champion move:** for every word you find, say what it means out loud. No meaning, no point.

S	G	Q	R	F	B	M	K	G	N	S	Q	D	R	C
N	U	F	D	O	G	N	M	O	Y	O	H	Y	U	T
O	Q	S	I	I	A	E	I	I	T	L	E	J	O	I
I	K	P	P	X	S	T	C	N	X	U	F	A	E	T
T	P	Q	A	E	A	T	E	O	D	T	R	U	E	Y
U	O	X	O	R	N	V	I	T	L	E	U	A	F	N
L	Q	K	T	A	L	S	O	L	W	L	G	R	D	D
O	X	L	M	O	Z	P	I	J	L	N	O	P	E	A
S	I	I	S	W	P	U	R	O	A	A	Y	I	K	L
F	D	R	P	T	Y	Q	O	P	N	J	T	Y	D	L
E	N	O	I	T	A	R	O	P	A	V	E	I	I	W
Z	L	L	E	N	N	U	F	S	M	O	K	E	O	D
T	D	E	C	A	N	T	A	T	I	O	N	W	N	N
N	Q	N	O	I	T	A	M	I	L	B	U	S	O	E
X	Z	V	V	Y	T	I	L	I	B	U	L	O	S	S

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Puzzle 3 · Scrambled Terms

Unscramble the word. The clue in brackets is your lifeline — try to solve without it first.

1. **R O T H A Y A P O C R M H G** *(separates coloured components on paper)* _____
2. **L T C U G A N O I A O** *(colloidal particles clumping together)* _____
3. **N A O L B T S I M U I** *(solid turning directly to gas)* _____
4. **E U S A D T R T A** *(holding the maximum dissolved solute possible)* _____
5. **R O E U I N N F T T C A I G** *(spinning a mixture at high speed to separate it)* _____
6. **A T I D O N T N C A E** *(carefully pouring off a liquid, leaving sediment behind)* _____
7. **I T C H E R R O P** *(the smell of rain on dry earth)* _____
8. **S R A E I N T A P G** *(___ funnel — used to split two immiscible liquids)* _____

🏁 Make It a Game

- **Beat the Bell**: 60-second timer. 1 point per word; 3 points if you can define it.
- **Chain Scramble**: Scramble a word for a teammate. Miss it and you are out.

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Puzzle 4 · Odd One Out

Three belong together. One does not. Circle the odd one — then write why. The "why" is where the marks are.

1. **Solute · Solvent · Solution · Suspension**

   Because...

2. **Filtration · Decantation · Centrifugation · Combustion**

   Because...

3. **Smoke · Fog · Milk · Salt water**

   Because...

4. **Sugar · Salt · Sand · Sewage water** (mixture types)

   Because...

5. **Distillation · Chromatography · Sublimation · Coagulation**

   Because...

6. **John Tyndall · Robert Hooke · Camphor · Naphthalene**

   Because...

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Puzzle 5 · Chapter Scrabble

Build only terms from this chapter — no ordinary English words allowed.

Scoring Rules:

- Each letter tile used: Its tile value
- Word is a term from this chapter: × 2
- Word is 8 letters or longer: + 10 bonus
- You can state its meaning correctly: + 5
- You can connect it to a real-life example: + 3
- Word is not in this chapter (challenged and lost): − 5

📖 How a Round Works

- Build a word from the rack and write it on the board.
- Any opponent may challenge within 10 seconds: "That's not in this chapter."
- Open the textbook. Challenger is right: builder loses 5 points. Challenger is wrong: challenger loses 5 points.

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Puzzle 6 · Who Am I? — Clue Cards

Read only the first clue aloud; the class guesses. Wrong guess? Read clue 2. Fewer clues used = more points.

① I am a homogeneous mixture.
② I have a solute dissolved in a solvent.
③ I am a **solution**.

① I am the smaller-quantity substance in a solution.
② Sugar in tea is an example of me.
③ I am the **solute**.

① I am the larger-quantity substance in a solution.
② Water is usually me.
③ I am the **solvent**.

① I am between a true solution and a suspension.
② Milk and fog are examples of me.
③ I am a **colloid**.

⑤ My particles are large enough to settle and scatter light.
② Muddy water is an example of me.
③ I am a **suspension**.

① I turn a solid directly into a gas.
② Camphor and naphthalene undergo me.
③ I am **sublimation**.

⑦ I separate substances by their different boiling points.
② Crude oil is refined using me.
③ I am **distillation**.

① I separate coloured components based on how far they travel.
② I am used to separate leaf pigments.
③ I am **chromatography**.

① I spin very fast to separate components by density.
② A paperfuge is my low-cost cousin.
③ I am a **centrifuge**.

⑩ I am the maximum amount of solute a solvent can hold.
② I depend on temperature.
③ I am **solubility**.

⑪ I studied how colloidal particles scatter light.
② My name is attached to that scattering effect.
③ I am **John Tyndall**.

① I am careful pouring, leaving sediment behind.
② I need no equipment beyond patience.
③ I am **decantation**.

(Scoring: guessed after clue ① = 5 pts · after ② = 3 pts · after ③ = 1 pt)

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Puzzle 7 · True or False Sprint

Everyone stands. Teacher reads a statement. True → stay standing. False → sit down. Get it wrong and you are out.

1. A solution is a heterogeneous mixture.	☐ True	☐ False
2. Salt is the solute when dissolved in water.	☐ True	☐ False
3. A colloid's particles are large enough to settle out on standing.	☐ True	☐ False
4. Milk is an example of a colloid.	☐ True	☐ False
5. Sublimation turns a solid directly into a gas.	☐ True	☐ False
6. Distillation separates mixtures based on boiling point.	☐ True	☐ False
7. Chromatography can separate different coloured pigments.	☐ True	☐ False
8. A saturated solution can dissolve unlimited additional solute.	☐ True	☐ False
9. The Tyndall effect explains why colloids scatter light.	☐ True	☐ False
10. Filtration can separate two miscible liquids.	☐ True	☐ False
11. A separating funnel is used for two immiscible liquids.	☐ True	☐ False
12. Centrifugation separates components by spinning them at high speed.	☐ True	☐ False
13. Coagulation is the clumping together of colloidal particles.	☐ True	☐ False
14. Petrichor is the name for the smell of rain on dry soil.	☐ True	☐ False

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Puzzle 8 · Bingo

Fill the empty grid below with any 16 words from the word bank — in any order. Cross a box only when its meaning is called.

Word Bank: Solution · Solute · Solvent · Colloid · Suspension · Sublimation · Solubility · Distillation · Chromatography · Filtration · Evaporation · Centrifugation · Decantation · Coagulation · Tyndall effect · Saturated

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Puzzle 9 · Two Truths and a Lie

Two statements are true, one is a lie. Circle the lie — and correct it on the line.

Set 1

(a) Solutions can only be liquid.
(b) Air is a gaseous solution.
(c) Alloys are solid solutions.

The lie is _____. Corrected: _____

Set 2

(a) Colloid particles settle on standing.
(b) Colloids exhibit the Tyndall effect.
(c) Milk is an example of a colloid.

The lie is _____. Corrected: _____

Set 3

(a) Distillation separates by boiling point.
(b) Chromatography separates by boiling point.
(c) Chromatography can separate leaf pigments.

The lie is _____. Corrected: _____

Set 4

(a) Sublimation converts solid to liquid.
(b) Sublimation converts solid directly to gas.
(c) Naphthalene balls sublime over time.

The lie is _____. Corrected: _____

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Puzzle 10 · The Escape Challenge

Solve all five gates. Each gives you one digit. Collect all five to unlock the exit code.

GATE 1 — The Solution Gate

How many main components does a solution have (solute + solvent)? Use that number.

Digit: [ ]

GATE 2 — The Colloid Gate

Count the letters in TYNDALL.

Digit: [ ]

GATE 3 — The Separation Gate

How many separation techniques are named in this chapter's crossword (filtration, distillation, chromatography, centrifuge, sublimation, evaporation, decantation)? Take the first digit.

Digit: [ ]

GATE 4 — The Saturation Gate

Count the letters in SATURATED.

Digit: [ ]

GATE 5 — The Mixture Gate

How many broad mixture types are named (solution, colloid, suspension)? Use that number.

Digit: [ ]

EXIT CODE: [ ] [ ] [ ] [ ] [ ]

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